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In re application of	:	**Confirmation No. 6357**
Tomohiko TANIGUCHI et al.	:	Attorney Docket No. 28952202
Serial No. 10/568,776	:	Group Art Unit 2611
Filed February 21, 2006	:	Examiner Kevin Y Kim

RECEIVING DEVICE

DECLARATION REGARDING TRANSLATION OF PCT/JP2003/015123

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Kazuo INOUE of c/o Panasonic Corporation Intellectual Property Rights Operations Company 6F OBP Panasonic Tower, 2-1-61, Shiromi, Chuo-ku, Osaka-shi, Osaka, 540-6206 Japan declare:

(a) that I am well acquainted with the English and Japanese languages and am competent to translate from Japanese into English;

(b) that International Application No. PCT/JP2005/013480 (hereafter "the '480 international application"), of which the present application (i.e., US Serial No. 10/568,776) is the National Stage, includes a sentence that was inadvertently not included in the present application. In particular, in the paragraph [0090] of the present application, the phrase "power amount α is counted out." should have been translated to read — power amount α is counted out in weighting amount. -- This language can be found in the '480 international application in the paragraph [0078], a copy of which is attached hereto; and

(c) that the above-noted translation of the language in the '480 international application is a true and correct translation.

Dated this 2th day of February, 2009

K. Inoue

Kazuo INOUE

result if not fewer than half of the complex signals are judged as within the threshold (majority rule), and "fail" if fewer than half.

[0085] In a 4-branch diversity receiving device, for example, the following values are calculated for complex signals A, B, C, and D.

$f(a)=l(AB)+l(AC)+l(AD)$

$f(b)=l(BA)+l(BC)+l(BD)$

$f(c)=l(CA)+l(CB)+l(CD)$

$f(d)=l(DA)+l(DB)+l(DC)$

[0086] ("l" indicates the distance between received signal points.)

[0087] Judgement for distance is made by comparing these values with the threshold preliminarily determined. As a result of the judgement for distance, "pass" is output to synthesizing unit **108** if two or more distances are within the threshold.

[0088] Reliability judging unit **107** further outputs to synthesizing unit **108** the judgement result for distance for each complex signal. In the above example for 4-branch diversity, the comparison result of each of f(a), f(b), f(c), and f(d), with the threshold is output to synthesizing unit **108** as the judgement result for distance.

[0089] Synthesizing unit **108** synthesizes complex signals obtained from demodulating units **106***a* through **106***n*, according to the weighting amount calculated from the power amount of the carriers obtained from the same demodulating units **106***a* through **106***n*. In this case, synthesizing unit **108** adjusts the weighting amount based on the judgement result for distance received from reliability judging unit **107**. The power amount is set to "0" if information has been received indicating that the judgement result for distance is equal to or larger than the threshold, for example. As shown in **FIGS. 6 and 7**, in the example for 4-branch diversity, if only the judgement result for distance: f(a) is equal to or larger than the threshold, assuming the power amount of f(a) through f(d) are α, β, γ, and ϵ, respectively, the weighting amounts of f(a) through f(d) are $0/(\alpha+\beta+\gamma+\epsilon)$, $\beta/(\alpha+\beta+\gamma+\epsilon)$, $\gamma/(\alpha+\beta+\gamma+\epsilon)$, and $\epsilon/(\alpha+\beta+\gamma+\epsilon)$, respectively.

[0090] Otherwise, a complex signal synthesized based on the judgement result for distance can be selected as well in synthesis. In the example for 4-branch diversity, assumption may be made that f(a) is not used for synthesis and power amount α is counted out. It is the same as in the description for the first exemplary embodiment that synthesizing unit **108** outputs reliability information based on a judgement result obtained from reliability judging unit **107**.

[0091] This method enables preventing the following problem. That is, when performing a diversity process that receives by multiple antennas a signal transmitted with multivalued QAM modulation method, and after performing the processes ending with demodulation for each signal, selects or synthesizes the signals, the position of the reception point largely separates from that of the transmission point because at least one received signal is affected by a noise signal, and as a result of synthesizing the signals including one affected by a noise signal, the position of the reception point is estimated as a position away from the transmission point on the contrary.

[0092] In other words, the following method enables preventing degration in reception performance due to a disturbing signal. That is, if some received signals have been affected by a disturbing signal, the method selects by majority rule received signals estimated as not being affected by a disturbing signal, and synthesizes with increasing the weighting amount for such received signals or with using only such received signals.

[0093] In the second exemplary embodiment, reliability judging unit **107** is to output to synthesizing unit **108** "pass" as the judgement result if not fewer than half of the complex signals are judged as within the threshold. Here, the percentage of distances that are within the threshold with which judgement is made as "pass" is arbitrarily determined. The higher the percentage is, the higher the "pass" criterion is.

[0094] Further in the second exemplary embodiment, reliability judging unit **107** sums the distances with which a received signal point itself is an origin, out of the distances between received signal points calculated, and compares this sum with the threshold to judge for distance, but not limited to this means. Besides, any means can be used as long as it can select complex information with high reliability out of multiple pieces of complex information obtained. For example, as a result that judgement for distance is individually made by comparing each distance between other complex signals received, with the threshold, received complex signals can be selected based on the number of judgement results of individual distances that are "pass". In the example for 4-branch diversity, only the distance between received signal points A and B exceeds the threshold. In this case, judgement results for individual distances are expressed as follows, where a "o" mark indicates "within the threshold" and a "x" mark, "exceeding the threshold":

$(l(AB), l(AC), l(AD))=(x, o, o)$ A:

$(l(BA), l(BC), l(BD))=(x, o, o)$ B:

$(l(CA), l(CB), l(CD))=(o, o, o)$ C:

$(l(DA), l(DB), l(DC))=(o, o, o)$

[0095] At least one "x" mark exists in the judgement results for individual distances, the distance between the two received signal points is judged as "fail." In this case, the distance between received signal points A and B mentioned above is judged as "fail." However, the judgements for two received signal points out of the four are "pass", and thus the judgement result is "pass" (majority rule).

[0096] In this case, the following method may be used. That is, the method counts the number of "o" marks obtained from the judgement result for individual distances for each received signal point, weights the judgement result according to the count, and synthesizing unit **108** to which the judgement result for distances is input uses the judgement result as a guide to adjust the weighting amount when synthesizing. A possible weighting amount is $(\frac{2}{3})\times[\alpha/(\alpha+\beta+\gamma+\epsilon)]$, $(\frac{2}{3})\times[\beta/(\alpha+\beta+\gamma+\epsilon)]$, $(3/3)\times[\gamma/(\alpha+\beta+\gamma+\epsilon)]$, or $(3/3)\times[\epsilon/(\alpha+\beta+\gamma+\epsilon)]$.

[0097] In this case, a received signal point for which not fewer than half of judgement results for individual distances are "fail" can be weighted as "0" or excluded from the choices.

[0098] Here, in the second exemplary embodiment, examination is made for a case where received signal points

～106nから入手したキャリアの電力量から算出した重み付けに従って合成処理する。この際、合成部108は、信頼性判定部107から受取った距離の判定結果に基づいて重み付け量を調整する。例えば、距離の判定結果が閾値以上であるとの情報を受取っている場合、電力量は0に設定する。図6、図7に示すように、先の4ブランチダイバーシティの例で、f(a)の距離の判定結果のみが閾値以上となる場合、f(a)～f(d)それぞれの電力量をα、β、γ、εとすると、f(a)～f(d)の重み付け量は、それぞれ0／(α＋β＋γ＋ε)、β／(α＋β＋γ＋ε)、γ／(α＋β＋γ＋ε)、ε／(α＋β＋γ＋ε)となる。

[0078] 他にも、合成において、距離の判定結果に基づいて合成する複素信号を選択することも可能である。先の4ブランチダイバーシティの例では、f(a)は合成のために用いず、電力量αは重み付けにおいて考慮しないとしてもよい。

[0079] 合成部108が信頼性判定部107から入手した判定結果に基づいて信頼性情報を出力する点は、実施の形態1において説明したものと同様である。

[0080] これにより、多値QAM変調方式により送信された信号を複数のアンテナで受信し、それぞれの信号に対して復調処理まで行った後に選択または合成するダイバーシティ処理を行う場合に、少なくとも1つの受信信号がノイズ信号の影響を受けたため受信点の位置が送信点と大きく離れ、ノイズ信号の影響を受けた信号を用いて信号を選択または合成した結果、かえって受信点の位置を送信点から離れた所に推定してしまうことを防止することが可能となる。

[0081] すなわち、一部の受信信号が妨害信号の影響を受けていた場合には、妨害信号の影響を受けていないと推定される受信信号を多数決判定により選択し、妨害信号の影響を受けていないと推定される受信信号の重み付け量を大きくしたり、妨害信号の影響を受けていないと推定される受信信号のみを用いて合成処理を行なうことで妨害信号による受信性能の低下を防止することが可能となる。

[0082] 本実施の形態2では、信頼性判定部107において、複素信号ごとに行なわれた距離の判定結果の半数以上が閾値以内であった場合に合格の判定結果を合成部108に出力することとしている。ここで、何%が閾値以内の場合に合格判定とするかは任意に決定できる事項である。閾値以内となる距離の判定結果の%が高いほど合格